mark: 23.5/25 — قياسات كهربائية — 23.5 — MW 9.30 - 11.00

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Q1 — تعريفات

Drift: it is ~~Undesired~~ Undesired change in the ~~output~~ input relationship over aperiod of time.

Resolution: it is the smallest change in the measured value on which the instrument will respond.

Q2 — 50 mile/hour — Convert from mile/hour to: ⓐ km/hr ⓑ ft/s

a- $50 \frac{mile}{hour} \times \frac{1.609\ km}{1\ mile} = 80.45\ km/hr$

b- ① $50 \frac{mile}{hour} \times \frac{1609\ m}{1\ mile} \times \frac{1\ hour}{3600\ s} = 22.34\ m/s$

② $22.34 \frac{m}{second} \times \frac{1\ ft}{0.3048\ m} = 73.29\ ft/s$

Q3 — سؤال الـ3

a) $E = \frac{V}{L} = \frac{ML^2T^{-3}I^{-1}}{L} = ML^1T^{-3}I^{-1}$ — Derivation

b) Unit of electric field strength = V/m

أوجد الوحدة و Dimension لوحدة المجال الكهربائي (E)

⑨ average range of error

σ^2 Variance / Probable error / ⑥ / average of deviation : اوجب

e d c b

Q5

1000.2 Ω, 1000.8 Ω, 999.2 Ω, 999.5 Ω, 999.0 Ω, 1000.6 Ω, 1000.0

$$E_{av} = \frac{1000.2 + 1000.8 + 999.2 + 999.5 + 999.0 + 1000.6 + 1000.0}{7}$$

$$= \boxed{999.9}\ \Omega$$

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⑨ The average range of error

$$X = E_{max} - E_{av} = 1000.8 - 999.9 = \boxed{0.9}$$

$$Y = E_{av} - E_{min} = 999.9 - 999.0 = \boxed{0.9}$$

∴ average range of error $= \frac{X+Y}{2} = \frac{0.9+0.9}{2}$

$\frac{1.8}{2} = \boxed{0.9}$

$d_1 = x_1 - \bar{x} = 1000.2 - 999.9 = \boxed{0.3} \Rightarrow d^2 = \boxed{0.09}$

$d_2 = x_2 - \bar{x} = 1000.8 - 999.9 = \boxed{0.9} \Rightarrow d^2 = \boxed{0.81}$

$d_3 = x_3 - \bar{x} = 999.2 - 999.9 = \boxed{-0.7} \Rightarrow d^2 = \boxed{0.49}$

$d_4 = x_4 - \bar{x} = 999.5 - 999.9 = \boxed{-0.4} \Rightarrow d^2 = \boxed{0.16}$

$d_5 = x_5 - \bar{x} = 999.0 - 999.9 = \boxed{-0.9} \Rightarrow d^2 = \boxed{0.81}$

$d_6 = x_6 - \bar{x} = 1000.6 - 999.9 = \boxed{0.7} \Rightarrow d^2 = \boxed{0.49}$

$d_7 = x_7 - \bar{x} = 1000.0 - 999.9 = \boxed{0.1} \Rightarrow d^2 = \boxed{0.01}$

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⑥ average deviation $= \frac{|d_1| + |d_2| + |d_3| + |d_4| + |d_5| + |d_6| + |d_7|}{7}$

$= \frac{0.3 + 0.9 + 0.7 + 0.4 + 0.9 + 0.7 + 0.1}{7} = \boxed{0.57}$

ⓒ $\sigma = \sqrt{\frac{\Sigma d^2}{n-1}} = \sqrt{\frac{2.86}{7-1}} = \sqrt{\frac{2.86}{6}} = \boxed{0.69}$

[d] Probable error = $0.6745(6) = 0.6745(0.69)$

$= \boxed{0.465}$

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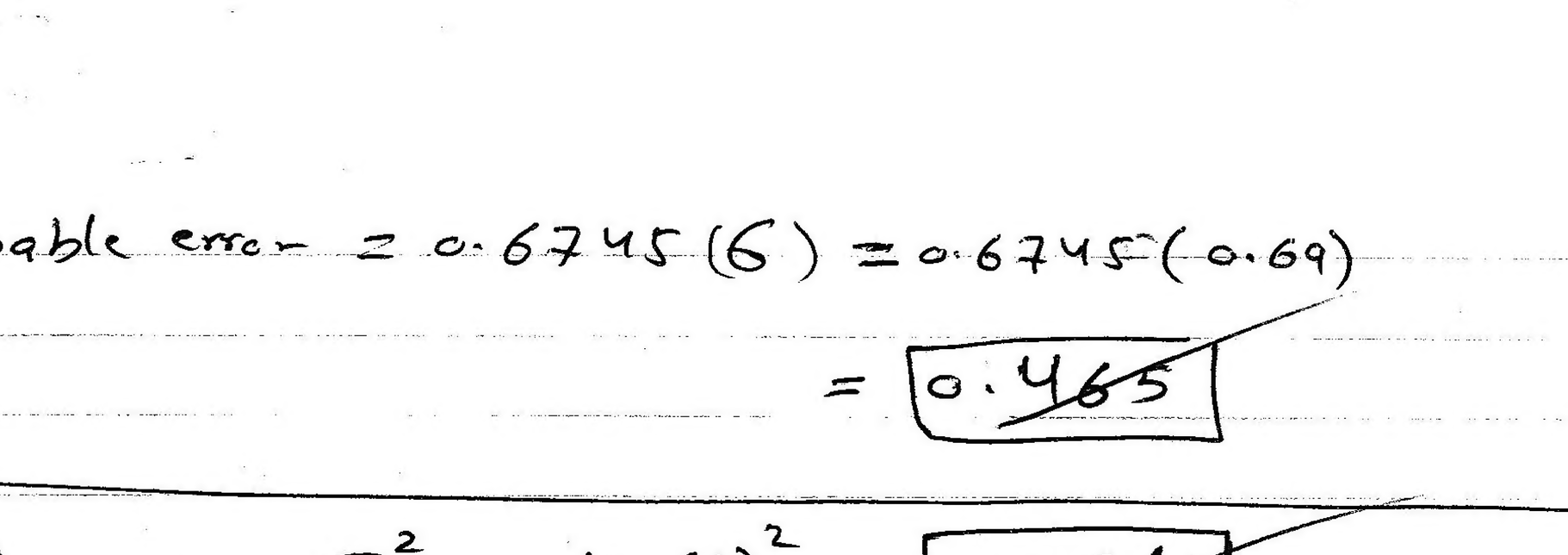
[e] Variance = $\sigma^2 = (0.69)^2 = \boxed{0.4761}$

Q4 Find R_1 / R_2 / R_3



This is a DC Voltmeter

~~at 50V~~ at 50 V

$R_3 = \frac{V}{I_m} - R_s = \frac{50}{50\ MA} - (100\Omega + 1k\Omega) = \boxed{998.9\ k\Omega}$

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at 10V

$R_2 = \frac{V}{I_m} - R_s = \frac{10}{50\ MA} - (100\Omega + 1\ k\Omega) = \boxed{198.9\ k\Omega}$

~~R~~ at 5V

$R_1 = \frac{V}{I_m} - R_s = \frac{5}{50\ MA} - (100\Omega + 1\ k\Omega)$

$= \boxed{98.9\ k\Omega}$